

Companion Narrative Document to the [April 7, 2009] DWR Proposed California Building Standards Code Update Draft document.

For discussion only at the April 13-14, 2009 Public Workshops.

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1. Background & Use of This Document

This document is intended to provide clarity on the Department of Water Resources (DWR) proposed California Building Standards Code update (proposed Code update) *document* with stated expiration date of April 7, 2009. That available draft document will be amended as noted in this document based upon recent project developments and review comments received to date. This document is being made available at the April 13th and 14th public workshops for first viewing. Additional public review comments will be taken to account and further enhance the proposal. Illustrations of buildings that would meet the proposed Code update requirements are shown in a companion public meeting handout. It is recommended that this document be read in conjunction with the proposed Code update and with the illustrations for proper understanding.

In brief, the proposed Code update intends to do the following for defined types of structures (e.g., educational) in a delineated area (forthcoming) of the California Central Valley:

- Attempt to mitigate the threat of entrapment in a building and/or drowning due to rise of flood waters
- Attempt to mitigate structural collapse of building caused by non-violent flood waters
- Provide temporary safe haven or flood “Evacuation Location” above surface of the predicted “200-year” flood water either within or on top of the building until people can be rescued
- Provide reasonable path to the Evacuation Location and unhampered exit accommodations from that location.

For background material on how DWR arrived at Evacuation Locations as the proposed solution to mitigate drowning and entrapment, please refer to the April 13th/14th workshop presentation materials. If more in depth material is desired, please refer to “project” documents on the project website found at www.water.ca.gov/BuildingCodeUpdate.

The individuals who are responsible for development of an appropriate Code proposal update package being delivered to the California Building Standards Commission (CBSC) by that agency’s July 1, 2009 deadline are referred to as the “Building Codes Team” (BC Team) in this document. On that date, the CBSC begins another “annual” update cycle to the California Building Standards Code (Code).

2. Application to Specific Occupancies.

In the upcoming Code cycle, DWR will propose mandatory requirements for Group E (Educational), Group R-3 (one- and two-family homes) and Group R-3.1 (licensed as 24-hour residential care facilities with 6 or fewer clients). DWR will also propose voluntary provisions for Group I (medical and care facilities) and the remainder of Group R, such as hotels and apartments.

The available draft of the proposal was prepared prior to the decision to focus on vulnerable and dependent persons. The reason that draft contained specific references to Groups E, I

and R occupancies is to require that an accessible means for occupants to escape the Evacuation Location during conditions of flooding be provided. The BC Team acknowledges this is a new concept – the CBSC does not currently require accessible means of escape in an emergency. Section 1007 of the CBSC does have criteria for accessible means of egress and even permits use of elevators in the event of a fire. The main means of escape required by the Code are emergency escape and rescue openings for Groups I-1 and R occupancies. Groups E, I and R occupancies have vulnerable occupants, such as public school students, hospital patients and sleeping persons. They are either not able to rescue themselves in the event of an emergency or may not be awake or aware when the emergency occurs.

3. Placement of the Code Provisions in the CBSC.

The TAC has discussed placement of the provisions in Chapter 4, Chapter 16, or a combination. The BC Team has determined that placement in Section 1612 would not be appropriate because it applies only to 100-year floodplains.

Sections in Chapter 4 include provisions for special uses and occupancies that add to the requirements of the Code. In that respect, it is appropriate to put the proposed provisions in Chapter 4 because they will be in additional requirements. However, the sections are for specific uses (e.g., covered mall buildings; underground buildings; pet kennels; winery caves; etc.).

A recent suggestion is to create a new lettered Chapter 31G. Chapter 31 is for Special Construction, including membrane structures, temporary structures, pedestrian walkways and tunnels, awnings and canopies, marquees, signs, and towers and antennas. California state agencies have created five lettered chapters for public swimming pools, radiation, food establishments, tents and membrane structures, and marine terminals).

Both Chapter 4 and Chapter 31 have sections specific to certain occupancies, uses, and certain structures other than buildings. The proposed Code update provisions are written to apply to select occupancies in the upcoming cycle (first cycle for DWR) in the delineated area.

The California Department of Housing and Community Development (HCD) plans to adopt chapters 3 through 10 of the International Residential Code (IRC) in the upcoming Code cycle. These chapters cover single (one and two) family residential units. Therefore, the proposed modifications to the Residential one- and two-family homes (R-3) will be located within that new California Residential Code (likely “CRC”). It is understood that the Group R-3.1 is not a sub-group of R-3 occupancy and will not be located in the new CRC. Therefore changes to the R-3.1 occupancy will be located in the California Building Code (CBC).

The benefit of a section in Chapter 4 is that all requirements are in one location. However, it may be appropriate to put the structural provisions in Chapter 16 (and have text in the Chapter 4 section to refer to it).

4. Application to Existing Buildings.

The available draft of the proposal was prepared prior to a final decision to include provisions for existing buildings. Many of the at-risk areas are significantly developed. DWR recognizes that Code requirements only apply to new construction and to existing buildings when owners propose certain types of work. Thus, many people and buildings will continue to be at-risk because most existing buildings are unlikely to undergo significant renovations.

At this time, DWR is inclined to use the trigger that is in the Code for buildings in the 100-year floodplain. That trigger is based on the dollar value of work on existing buildings – when the cost of work equals or exceeds 50% of the market value of the building, compliance is required. Work might be additions, renovations, alterations, or repairs. Those familiar with the requirements for floodplains know this as “substantial improvement” and “substantial damage”. The requirement would be that the owner would have to identify an Evacuation Location that has an acceptable route to it, and from which occupants can be easily accessed and rescued. DWR anticipates that many existing buildings will be able to provide an Evacuation Location without significant alterations. For example, a second floor may already be above the predicted 200-year water surface elevation (WSEL200) and of sufficient size given the number of occupants, so compliance would be achieved by providing an acceptable window for rescue.

This trigger will mean that most of the existing population will not have added safety. DWR will continue to consider options to increase public safety. One approach that would not be accomplished through the building Code might be to require owners of existing buildings to identify their vulnerability and identify evacuation options. In rare circumstances where the lack of safety is so great, such as with unreinforced masonry (URM) buildings, sufficient societal support was acquired to require all URM buildings in California to be structurally improved to a minimum level. This was implemented in phases over a long period.

Change of Use for occupancies is also being considered by the BC Team, such that when buildings change use into one of the occupancies covered by these Code provisions, the building would need to comply with applicable provisions.

5. Accessibility.

All buildings and structures that are required to be accessible are required by the draft proposal to extend that accessibility to provide an accessible route to the Evacuation Location and an accessible Evacuation Location. Those uses that are not required by Chapters 11A or 11B to be accessible are not required to have accessible routes to the Evacuation Locations or to have accessible Evacuation Locations. It is not the intent of this proposal to increase the application of accessibility criteria to uses that are not now required to be accessible. DWR recognizes that where accessibility is provided by elevators, service equipment essential to the operation of the elevator be elevated above the WSEL200. The BC Team is considering this proposal to extend the duration of elevator accessibility prior to inundation.

Another concern was the application of accessibility criteria in mixed uses or in those instances where Chapters 11A and 11B are applied. It is not the intent of this proposal to change the application of accessibility criteria. In all cases, the more restrictive requirements would apply.

6. Sizing the Evacuation Location.

The draft requires Evacuation Locations to have a minimum gross floor area of 7 ft² per occupant, based on the occupant load of the portions of the building that are below WSEL200.

Some of the areas protected by the facilities of the CVFPP may have flood conditions that last more than a day. Given the large size of the vulnerable areas and the very large number of buildings that may have to be evacuated, it is reasonable to assume that people may need to remain in the Evacuation Location for 24 hours or more. Therefore, more space than is required for standing room is appropriate. Table 1004.1.1 Maximum Floor Area Allowances per Occupant, specifies 7 ft² (net) per occupant for space that functions as assembly without fixed seats, concentrated (chairs only-not fixed). For assembly standing space, 5 ft² (net) is specified.

The BC Team also considers that in buildings required to be accessible, 7 ft² (gross) provides adequate area for wheelchairs, without having to explicitly call for additional space. A suggestion was made that the Evacuation Location be sized to provide 7 ft² per occupant, plus two wheelchair spaces measuring not less than 30" by 48" for every 200 person. At 20 ft² each, two spaces require 40 ft², or about 1.5% of the total area required for 200 people.

For comparison, FEMA Publication 361.1 *Design and Construction Guidance for Community Safe Rooms* recommends a minimum of 20 ft² per person for hurricane community safe rooms. The American Red Cross Publication No. 4496 recommends the following minimum floor areas for hurricane community safe rooms:

- 20 ft² per person for a short-term stay (i.e., a few hours to a few days)
- 40 ft² per person for a long-term stay (i.e., a day to weeks)

The ICC/NSA offers a diverse range of recommended minimum useable floor space in the ICC-500-200 publication entitled *Standards on the Design and Construction of Storm Shelters*. These range from 7 ft² for one- and two-family residential hurricane shelters to 40 ft² for bed-ridden community hurricane shelters. The BC Team will consider these published recommendations as well.

The BC Team recognizes that sizing the Evacuation Location for R-3 and R-3.1 may take a different approach than applying the occupant load of 200 ft² gross called for in the CBSC.

7. Area of Refuge.

The Code defines an Area of Refuge as "an area where persons unable to use stairways can remain temporarily to await instructions or assistance during emergency evacuation." The draft proposal does not limit the use of the area designated as an Evacuation Location when it

is not needed for emergencies. Evacuation Locations can be areas of interior floors, decks, balconies, and rooftops. So long as these building elements comply with the criteria for Evacuation Locations then they can also be used for other purposes. In addition, the requirements for Evacuation Locations and areas of refuge may be satisfied concurrently, it is the responsibility of the designer to satisfy all applicable requirements.

8. Decks and Balconies that are not at the Same Level as the Level of a Floor.

If the elevation of a floor is above WSEL200, the Evacuation Location may be an area on that floor. The BC Team expects some designers to raise a foundation so that a floor can be the Evacuation Location. An alternative would be to provide a deck or balcony that is not at the same elevation as a floor, but is higher in order to be above the WSEL200. For example, in areas with deep flooding where the WSEL200 is above the second floor, rather than use the rooftop or add a third story, an option would be to build a “super” deck or balcony. Because the “super” deck or balcony is not at the same elevation as a floor of the building, means must be provided for occupants to reach it by a stairway, ramp, alternating tread device, fixed ladder, lift, or other means approved by the building official. If the super deck or balcony is designed and intended for regular use, the current Code requirements apply on appropriate means of access/egress (e.g., properly designed stairs). The BC Team is considering the requirement that the super deck or balcony have proper access from the ground (e.g., the backyard).

9. Platforms, Sloped Roofs, Accessibility.

If the designer provides a rooftop Evacuation Location, the draft proposal requires a rooftop platform as a function of roof materials and slope. The concern is that some roof materials have a better coefficient of friction and some can be slippery when wet. The slopes specified in the proposal were selected for consistency with minimum slopes based on resistance to wind, not on empirical evidence of safety. However, as the issue has been discussed further, it appears that reduced slope is needed.

As noted in Item #5, if the buildings must be accessible, then rooftop Evacuation Locations must also be accessible. This may further influence when level platforms are provided because even shallow sloped surfaces may not comply.

10. Guards for Rooftop Platforms and Rooftop Areas.

The BC Team is planning to modify the Code proposal to require guards on all non-R-3 and R-3.1 occupancies when a rooftop area or platform is the Evacuation Location. Such edge protection might take the form of a guard system (railings or panels) or parapets. It is recognized that people on a rooftop Evacuation Location are surrounded by water, so the falling hazard is not equivalent to normal conditions. However, the distance from the roof to the water may still be considerable.

11. Attics as Evacuation Locations.

Subsequent to the distribution of the draft proposal, a question was asked regarding attics as Evacuation Locations. The BC Team sees no reason to preclude attics. In addition to all other Evacuation Location criteria applying, sufficient head-room shall also be provided. The

BC Team will amend the proposal document to require minimum head-room. It is envisioned that minimum head-room could be established at two distances to accommodate for the sloped ceiling (roof) and resting persons lying down. For example, 50% of the properly size Evacuation Location in attic space shall be a minimum of 30" tall and the remaining 50% shall be a minimum of 60" tall. Solidly sheathed flooring requirements may be necessary. The specified means for occupants to move from the Evacuation Location to the rescue vehicle would still apply, such as a gable-end window that meets the minimum size requirements or a hatch to the roof.

12. Stand-alone Decks (Not Accessible from within the Building) or Decks/Balconies on Accessory Buildings as Evacuation Location for Occupants of Primary Structure.

The BC Team has not drafted code for these options because occupants would have to exit the primary structure to reach the Evacuation Location, possibly having to move through rising floodwaters in the process. These alternatives could be considered under the Alternate Means of Protection provisions, where the building official would take into consideration comments from the "applicable emergency management authority regarding plans and processes related to notification of anticipated conditions of flooding, warnings, evacuations, and other pertinent conditions." See item #16.

13. Identification of Evacuation Location and Route on Construction Drawings.

In order for building officials, plan reviewers, and inspectors to know which area is to be used as an Evacuation Location, the area must be indicated on the plans. It is not necessary to explicitly call for this identification because it is the responsibility of the designer to demonstrate compliance. The clearest method would be similar to those used to illustrate accessibility and means of egress routes to and within buildings, which typically is shown on a separate sheet of the plans.

14. Signage for Some Occupancies.

The BC Team is considering a requirement to provide signage to direct occupants to the Evacuation Location and to identify the means by which occupants are expected to escape the building. Signage can be a useful tool to notify persons in transient occupancies, as is done for fire escape plans in hotels and motels. Some building code experts are concerned that signs lose their effectiveness on regular attending occupants who may forget that an Evacuation Location exists.

15. Emergency Equipment Storage Container

The BC Team is considering adding the requirement for an emergency equipment storage container to be located in or immediately near the Evacuation Location with signage on the container box that clearly indicates the intent of the box. Building Codes allow for requiring very few detachable devices, such as fire extinguishers. Extinguishers are typically inspected on an annual basis. There is a possibility to get inflatable rafts, personal floatation devices, and flare guns into this category. However, inflatable rafts, batteries for portable radios and similar devices cannot be expected to function properly after long-term (multiple years) storage without proper inspection and necessary repair or replacement. The storage box with

signage could be required. Signage would encourage occupants for proper emergency response with wording like the following:

- DO NOT intentionally remain in a flooding region. Evacuate the region to higher ground if there is good chance you (and the occupants you are responsible for) can make it.
- Store emergency equipment and supplies for floods in this container. These may include: personal floatation devices, flare guns, blankets, rope, portable radio with batteries, inflatable rafts, non-perishable foods and devices to open/use food, toiletries, and medications.
- Routinely inspect emergency supplies for proper functioning. Minimum time span should be not more than one year.

16. Alternate Means of Protection.

The proposed code includes a section for consideration of alternate means of protection. The BC Team deems it necessary because the Code's current provisions for approval of alternatives provide the building official the authority to approve alternative materials, designs and methods of construction (see below for Sec. 108.7 and Sec. 104.11). The BC Team anticipates alternatives will be sought if an owner wants to justify a means of protection that is other than providing an Evacuation Location. For example, a condominium or apartment complex developer may propose that a single Evacuation Location (e.g., in a communal recreation building) is sufficient for all occupants, especially if the community has good flood hazard monitoring and warning capabilities. Similarly, a developer may propose a "stand-alone" deck or an Evacuation Location in an accessory building to serve the primary building.

Two other reasons why the proposed alternate means of protection provision is necessary are (1) Sec. 108.7 pertains only to occupancies subject to the HCD requirements; and (2) Sec. 104.11 is in Appendix Chapter 1, which is voluntary.

[Department of Housing and Community Development]

108.7 ALTERNATE MATERIALS, DESIGNS, TESTS AND METHODS OF CONSTRUCTION

108.7.1 General.

The provisions of this code, as adopted by the Department of Housing and community Development are not intended to prevent the use of any alternate material, appliance, installation, device, arrangement, method, design or method of construction not specifically prescribed by this code. Consideration and approval of alternates shall comply with Section 108.7.2 for local building departments and Section 108.7.3 for the Department of Housing and Community Development.

[Appendix Chapter 1 Administration]

104.11 Alternative materials, design and methods of construction and equipment.

The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material,

method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

17. Requirements to Elevate for FEMA-Mapped Flood Hazard Areas.

FEMA's National Flood Insurance Program develops maps to delineate areas that are prone to flooding by the 100-year flood (1%-annual chance flood). The NFIP regulations for the design and construction of buildings in floodplains are incorporated in the California Building Standards Code (and ASCE 24, a referenced standard in the Code). The primary requirement is elevation of the lowest floor (including basement) to or above the base flood elevation (only nonresidential buildings can be dry floodproofed).

Significant areas where the proposed code will apply are not shown on FEMA's maps as 100-year floodplains. Where an area is in both the 100-year floodplain and the area protected by the facilities of the CVFPP, a building must be designed to meet the requirements for both. Although the difference between the base flood elevation and the WSEL200 won't be known until the new maps are prepared, the BC Team anticipates that where a building must already be elevated, a designer may determine that reasonable solution is to add additional height to the foundation so it is elevated to the WSEL200, which then makes the lowest floor its Evacuation Location (and occupants would move through the at-grade exit doors to be evacuated).

Where an area is subject to flooding by the 200-year flood and is not mapped as 100-year floodplain, then only the proposed code will apply (not Section 1612). The BC Team anticipates that designers will consider "elevation" (that is, elevating a structure) as an option to raise the main floor above the WSEL200 so that it qualifies as the Evacuation Location. However, many of the areas that are protected by the facilities of the CVFPP will have flood depths greater than 8 feet deep (some areas will likely have flood depths in excess of 25 feet). The BC Team determined that requiring all buildings in all areas protected by the facilities of the CVFPP to comply with all of the requirements in Section 1612 would not be reasonable.

18. Hydrodynamic Loads are not Explicitly Considered.

The California Building Standards Code refers to ASCE 7, *Minimum Design Loads for Buildings and Structures* for loads, including flood loads. Flood loads include hydrostatic loads (imposed by depth of water) and hydrodynamic loads (imposed by moving water). Other flood loads are wave loads and debris impact loads. According to ASCE 7, Section 5.4.3, "[w]here water velocities do not exceed 10 f/s, dynamic effects of moving water shall be permitted to be converted into equivalent hydrostatic loads". Using the formula provided, 10 f/s converts to 1.9 ft. The BC Team estimates that most areas where the Code requirements will apply will have stagnant water or low flow velocities and the BC Team does not plan to designate velocities on the maps to delineate these areas. Thus, it is not necessary to explicitly consider hydrodynamic loads. The BC Team recognizes that high velocities will be experienced near where actual levee breaches occur, but such locations cannot be predicted and mapped.

The BC Team did consider the creation of “potential high velocity zones” that would define a swath of land on the land-side of levees (i.e., not the river side) where stricter Codes could be used. Fast flood water velocities only occur in the immediate vicinity of a levee breach (for relatively flat floodplains). The majority of these zones would not experience fast flood water velocities which would not be near the breach. As the potential benefits could not compare favorably to the costs, it was prudent to make such a recommendation.